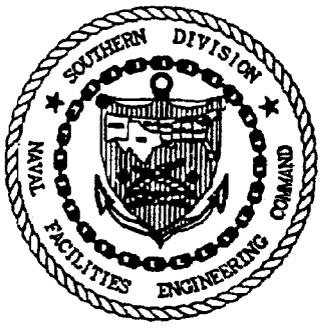
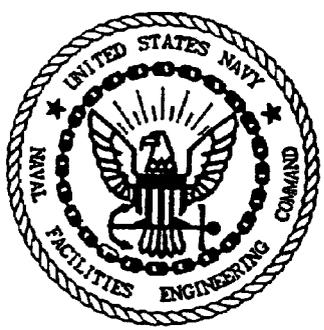


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CNC CHARLESTON
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SAMPLING AND ANALYSIS PLAN (SAP) FOR UNDERGROUND STORAGE TANK 6A AND
6B (UST 6A AND 6B) CNC CHARLESTON SC
06/26/1997
ENVIRONMENTAL DETACHMENT CHARLESTON

Li 7.31.97
Lo 10.13.97

Letter 10.14 ✓



SAMPLING AND ANALYSIS PLAN

USTs 6A and 6B
(SCDHEC GWPD SITE ID # 17626)
NAVAL BASE CHARLESTON
CHARLESTON SC

RECEIVED
JUL 09 1997
Groundwater Assessment
and Development Section

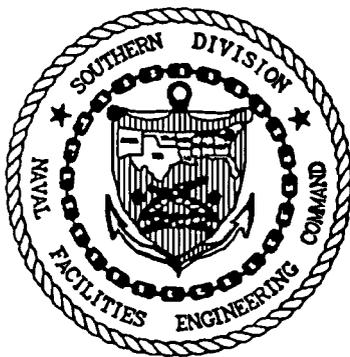
Prepared for:

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON SC

Prepared by:

Supervisor of Shipbuilding, Conversion and Repair,
USN, (SUPSHIP) Portsmouth Va.,
Environmental Detachment Charleston, S.C.
1899 North Hobson Ave.
North Charleston, SC 29405-2106

June 26, 1997



FORWARD

Subtitle I of the Hazardous and Solid Waste Amendments (HSWA) of 1984 to the Solid Waste Disposal Act (SWDA) of 1965 established a national regulatory program for managing underground storage tanks (UST) containing hazardous materials, especially petroleum products. Hazardous wastes stored in USTs were already regulated under the Resource Conservation and Recovery Act (RCRA) of 1976, which was also an amendment to the SWDA. Subtitle I requires that the U.S. Environmental Protection Agency (USEPA) promulgate UST regulations. The program was designed to be administered by the individual states, who were allowed to develop more stringent standards, but not less stringent standards. Local governments were permitted to establish regulatory programs and standards that are more stringent, but not less stringent than either State or Federal regulations. The USEPA UST regulations are found in the Code of Federal Regulations, Title 40, Part 280 (40 CFR 280) (*Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks*) and Title 40 CFR 281 (*Approval of State Underground Storage Tank Programs*). Title 40 CFR 281 was revised and published on September 23, 1988, and became effective December 22, 1988.

The Navy's UST program policy is to comply with all Federal, State, and local regulations pertaining to USTs. This plan was prepared to satisfy the requirements of South Carolina R.61-92, Part 280 (*Underground Storage Tank Control Regulations*), Section 280.65 to determine the extent and location of soils contaminated by a release from a UST system.

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ACRONYMS, ABBREVIATIONS AND SYMBOLS

| | |
|----------------------|---|
| bgs | below the ground surface |
| BTEX | Benzene, Toluene, Ethylbenzene & Xylene |
| CFR | Code of Federal Regulations |
| CSAP | Comprehensive Sampling and Analysis Plan |
| DET | Environmental Detachment Charleston |
| ft ² /day | square feet per day |
| gpm | gallons per minute |
| GWPD | SCDHEC Ground Water Protection Division |
| HSWA | Hazardous and Solid Waste Amendments |
| IDW | Investigation Derived Wastes |
| MSDS | Material Safety Data Sheet |
| NAVBASE | former Charleston Naval Base |
| RCRA | Resource Conservation and Recovery Act |
| RFI | RCRA Facility Investigation |
| SAP | Sampling and Analysis Plan |
| SCDHEC | South Carolina Department of Health & Environmental Control |
| SOUTHDIV | Southern Division Naval Facilities Engineering Command |
| SSHSP | Site-Specific Health and Safety Plan |
| SSL | Soil Screening Level |
| SWDA | Solid Waste Disposal Act |
| USEPA | U.S. Environmental Protection Agency |
| UST | Underground Storage Tanks |

1.0 INTRODUCTION

1.1 GENERAL. Two USTs located adjacent to former Charleston Naval Base Building 6 (refer to Figures 2-1, 2-2 and 2-3) were removed by Environmental Detachment Charleston (DET). Soil samples collected during removal of the USTs reflected concentrations of polynuclear aromatic hydrocarbons (PAH's) and compounds of the benzene, toluene, ethylbenzene and xylene (BTEX) group in excess of Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) soil screening levels (SSLs). The Sampling and Analysis Plan (SAP) outlines a field investigation and sampling program that will assess the source(s) of soil contamination at the site of the removed tank and evaluate the horizontal and vertical extent of the petroleum contamination detected. The field investigation will also determine whether contamination has entered the groundwater at the tank site. If groundwater has been contaminated, the extent of the contamination will be evaluated. The following report presents the site location and develops the rationale for the proposed field investigation.

1.2 USE OF RFI DATA. The former Charleston Naval Base is the site of an ongoing RFI. USTs 6A and 6B were formerly located in Zone E of the RFI. Data taken as part of the RFI, including geological information, hydrogeological information, well drilling logs and groundwater sampling data was used in the preparation of this SAP.

2.0 BACKGROUND

2.1 SITE DESCRIPTION. The former Charleston Naval Base (NAVBASE) is in the city of North Charleston, on the west bank of the Cooper River in Charleston County, South Carolina. The developed portion of the NAVBASE occupies the west bank of the Cooper River starting at a boundary 2300 feet upstream of Noisette Creek and ending at Shipyard Creek. The northern section of the NAVBASE (RFI Zones A, B, C and D) contains a mixture of warehouses, offices and former Navy housing areas. The central section of the NAVBASE (RFI Zones E and F) is occupied primarily by what was the controlled industrial area (CIA) of the former Naval shipyard and its associated offices and warehouses. The southern section of the NAVBASE (RFI Zones G, H and I) along the Cooper River is occupied by piers, barracks, training buildings, offices, storehouses and fuel tanks which formerly supported naval vessels homeported at Charleston. The north bank of Shipyard Creek in the southern part of the base is largely undeveloped and consists of recreational areas and a large dredge spoil area.

The removed USTs supplied fuel oil to Building 6 and Building 226 which are centrally located in the northern section of the NAVBASE on the southeast corner of Hobson Avenue and Second Street inside the former CIA.

2.2 SITE HISTORY. USTs 6A and 6B (Ground Water Protection Division (GWPD) site ID number 17626) were 2500 gallon unregulated fuel oil tanks installed in 1967 and used until an unknown date. The tanks were located under a concrete cap in the middle of an asphalt parking lot/lay-down area northeast of Building 6. The tanks were constructed of steel and were connected by a 6" spoolpiece at their bottoms. One set of piping (supply, return and vent) was routed from the north side of the tanks to Building 6. This piping was cross-connected with supply and return piping connected to AST 00219 on the west end of Building 226. There was another run of piping from the south end of the tanks to AST 00219. The reason for the double cross-connects is not known. Between 24 April 1996 and 15 May 1996, the USTs were removed, drained, cleaned and cut up for recycling as scrap. The piping associated with these tanks was also removed.

There were no recorded releases while the tank was in service. However, a strong petroleum odor was characteristic of soils excavated from portions of the piping runs associated with these tanks. Several holes of approximately 1/8" in diameter were found in the upper portion of both tanks and although no holes were found in the pipe runs, the pipes were heavily corroded throughout.

2.3 GEOLOGY. Charleston South Carolina is located in the southern Atlantic Coastal Plain. The surficial geology of the region consists of the Quaternary-age sands, silts and clays of the Wando Formation. Below the Wando Formation are the Oligocene-age Ashley Formation and the Eocene-age Parkers Ferry and Harleyville Formations, known collectively as the Cooper Group. Below the Cooper Group is the Eocene-age Santee Limestone.

At the NAVBASE, the upper surface of the Ashley Formation is an erosional surface ranging from 35 feet to 77 feet below the ground surface (bgs). Overlaying the Ashley Formation is the Wando Formation which, at the NAVBASE, typically consists of upper and lower sand layers divided by a layer of "marsh clay". The surface contours of the NAVBASE area were extensively changed by fill operations during the base's life, particularly in the lower portion of the NAVBASE, which was originally tidal marsh.

2.4 HYDROGEOLOGY.

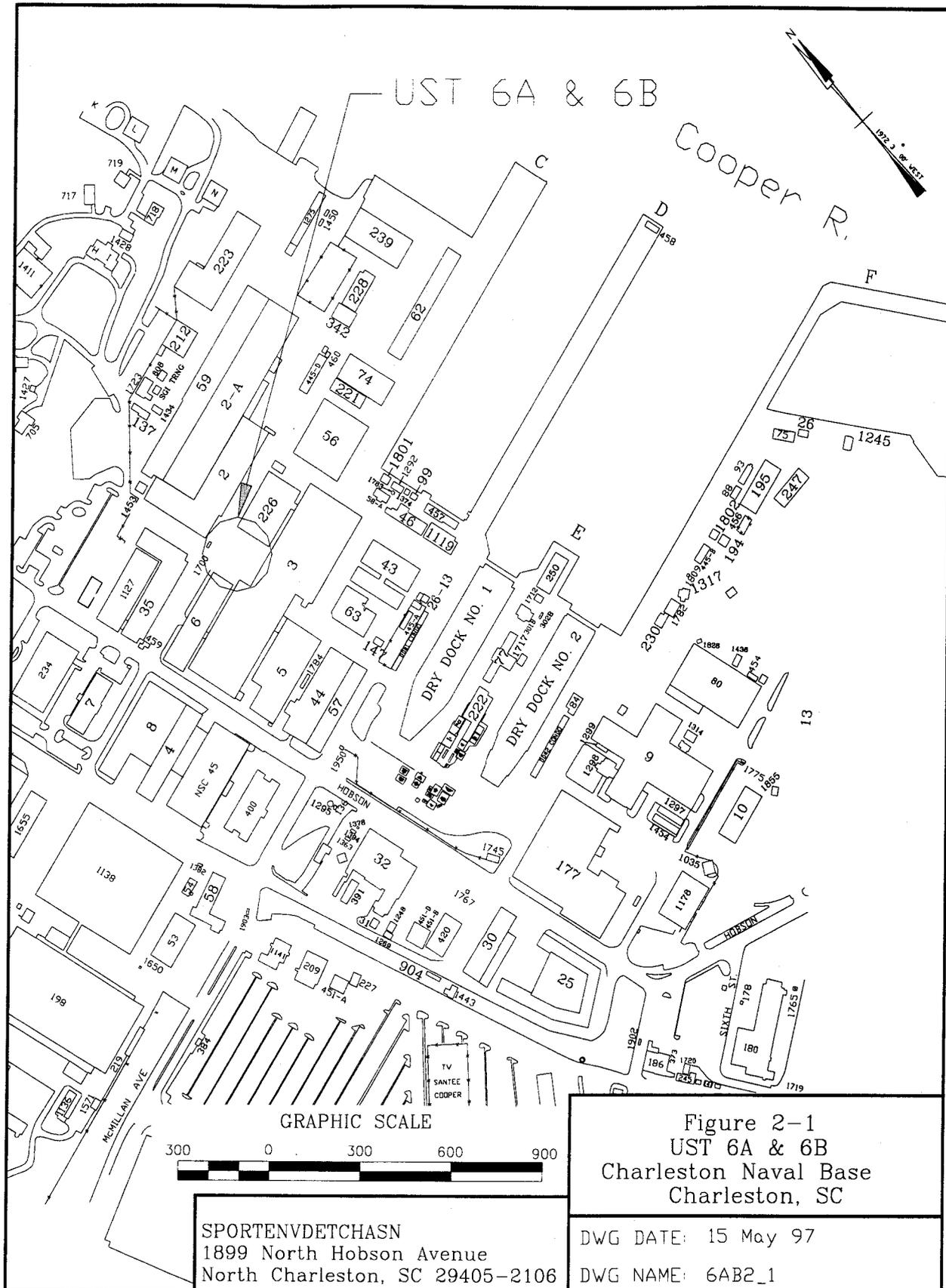
2.4.1 Regional. (Excerpted from Ensafe/Allen & Hoshall, Draft Zone I RCRA Facility Investigation Report NAVBASE Charleston dated January 1996.) Groundwater occurs under poorly confined or water table conditions within the Pleistocene deposits overlying the Ashley Formation. Transmissivities in the Pleistocene aquifer are generally less than 1,000 square feet per day (ft²/day) and well yields are variable, ranging from 0 to 200 gallons per minute (gpm). This groundwater contains high concentrations of iron and is commonly acidic at shallow depth (Park, 1985).

The Cooper Group is hydrogeologically significant mainly because of its low permeability. In most locales, its sandy, finely granular limestones produce little or no water and act as confining material that produces artesian conditions in the underlying Santee Limestone.

2.4.2 Site Specific. Typically, above the Ashley Formation at the entire NAVBASE are two sand layers divided by a clay layer described as "marsh clay" in the RFI Reports. The vertical hydraulic conductivity of the Ashley Formation beneath the NAVBASE is 0.0027 ft/day, based on measurements taken during the Zone H RFI. The vertical hydraulic conductivity of the marsh clay layer is 0.001 ft/day, based on measurements taken during the Zone I RFI. The Ashley Formation acts as a lower confining layer, while the marsh clay functions as an aquitard separating the upper and lower sand layers. At the NAVBASE, rainwater absorbed into the ground will flow downward to the marsh clay and then flow toward a discharge point into a body of surface water.

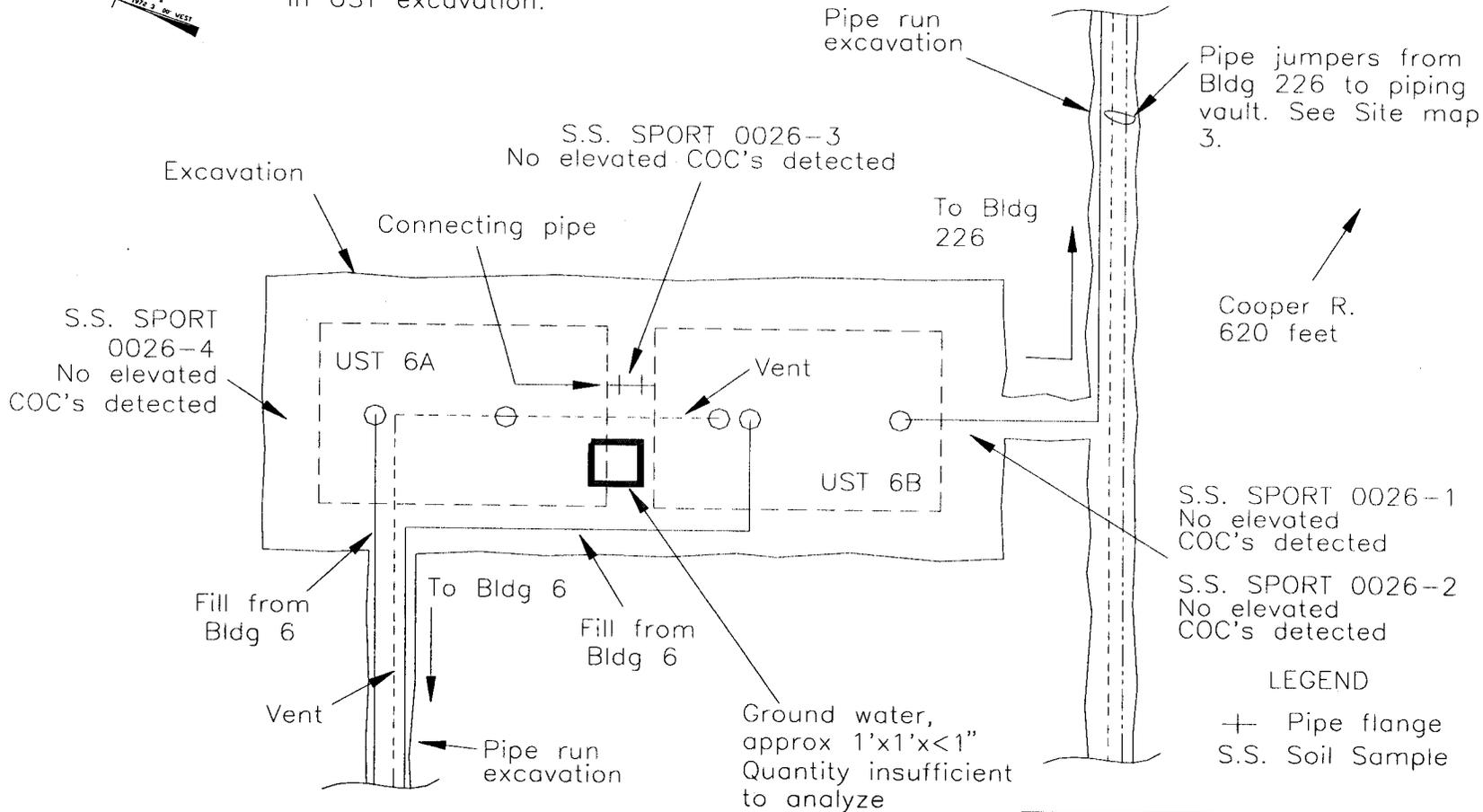
Parts of the southern portion of NAVBASE are drained by Shipyard Creek while some northern areas are drained by Noisette Creek. The drainage basins of both waterways include areas other than NAVBASE. These waterways are tributaries to the Cooper River. Surface Drainage Over the remainder of NAVBASE flows directly into the Cooper River, which discharges into Charleston Harbor.

The former site of USTs 6A and 6B is centrally located in the northern portion of the NAVBASE in Zone E approximately 620 feet from the Cooper River. Based on potentiometric data, groundwater beneath the UST location flows generally toward the southeast. From drilling logs for nearby monitoring wells, the depth to groundwater is 5 to 6 feet bgs.





* Mild petroleum odor present in UST excavation.



GRAPHIC SCALE

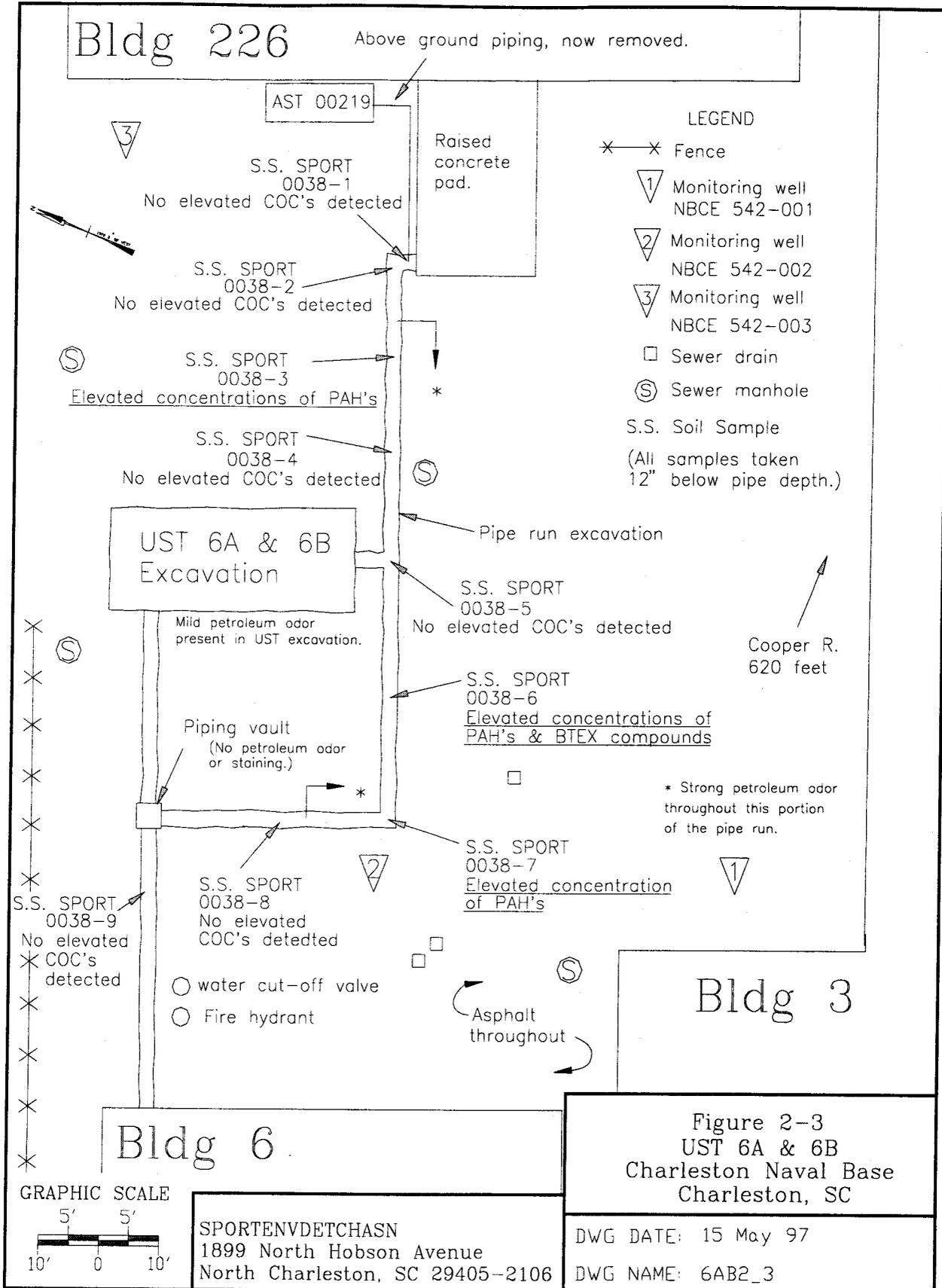


2-4

Figure 2-2
 UST 6A & 6B
 Charleston Naval Base
 Charleston, SC

SPORTENVDETHASN
 1899 North Hobson Avenue
 North Charleston, SC 29405-2106

DWG DATE: 15 May 97
 DWG NAME: 6AB2_2



3.0 INVENTORY OF PROXIMATE POTABLE WATER WELLS

There are no potable water wells on the NAVBASE. Groundwater in the surficial aquifer at the NAVBASE discharges into the Cooper River and its tributaries and therefore flows away from any potable water wells in residential areas nearby.

4.0 BACKGROUND

4.1 FIELD INVESTIGATION. Prior to the beginning of the field investigation, a pre-work briefing will be held. All DET personnel associated with the investigation will review the scope of work in the SAP and the Site Specific Health and Safety Plan (SSHSP). Scheduling, logistics and special precautions will be discussed.

The purpose of the field investigation is fourfold. The first objective is to evaluate the horizontal and vertical extent of contamination at the site from BTEX compounds. The second objective is to determine the horizontal and vertical extent of contamination at the site from PAH's. The third objective is to determine whether contamination has entered the groundwater at the tank site, assess the areal extent of the contaminant plume, if one exists, and install monitoring wells to detect plume movement off the site. The final objective is to collect site-specific background information required to prepare the contamination assessment report.

A minimum of 16 soil borings will be made, of which 3 will be completed as upgradient temporary monitoring wells and 1 will be completed as a downgradient temporary monitoring well (refer to Figure 4-1). The borings completed as monitoring wells will be advanced using a portable drill rig and soil samples will be collected using a split-spoon sampling device. Remaining soil borings will be advanced with a hand auger. In all soil borings, samples will be collected in 2-foot intervals until the water table is reached. Water samples will be taken from all temporary monitoring wells. All sampling will be performed in accordance with the RFI Comprehensive Sampling and Analysis Plan (CSAP). All monitoring wells will be installed in accordance with South Carolina R. 61-71, *Well Standards and Regulations*. The proposed soil boring locations are shown in Figure 4-1. Actual locations of soil borings will be determined by the field team as more information is obtained about the contaminant plume during soil sampling.

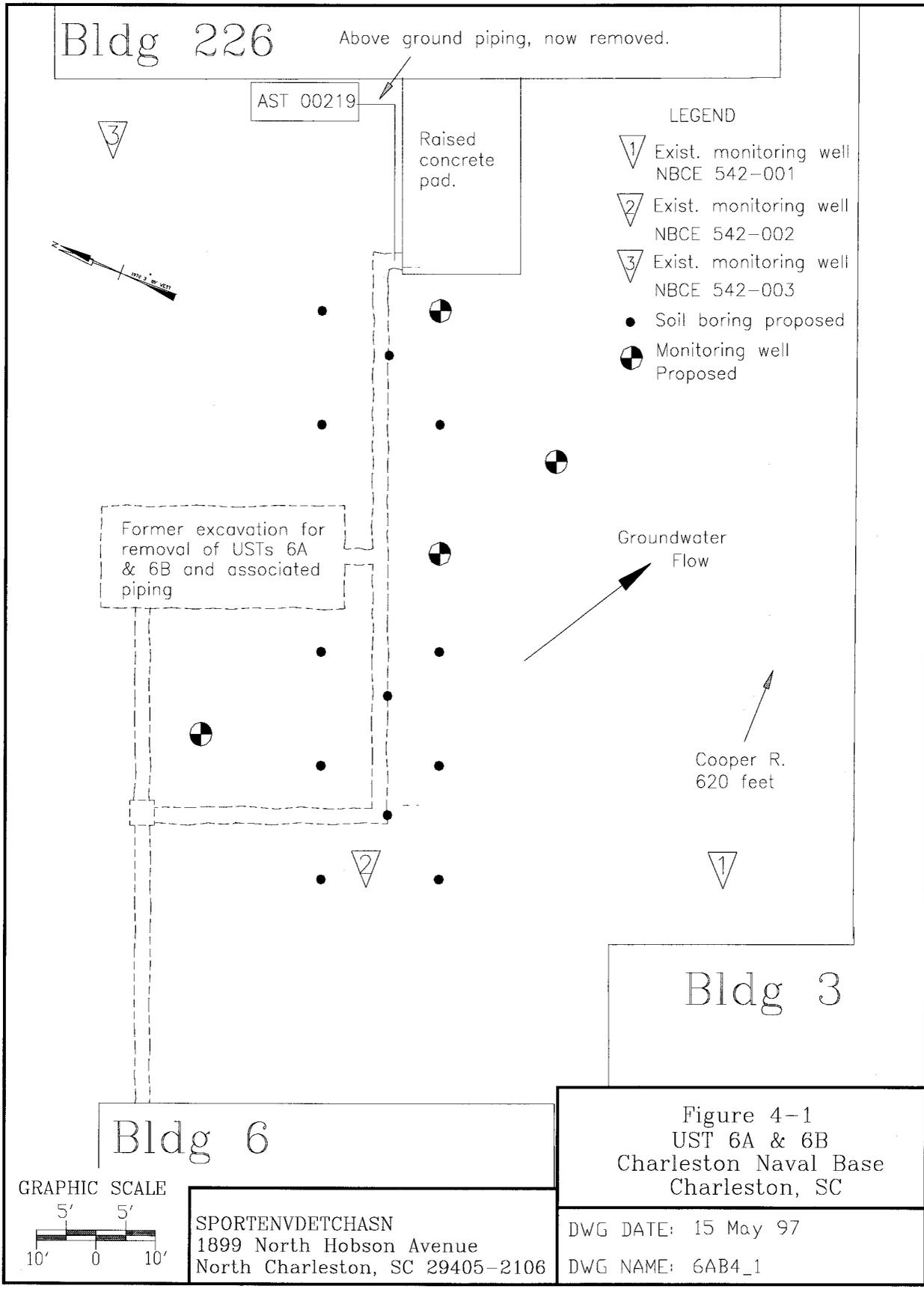
Where the initial 16 soil borings are not sufficient to define the extent of the plume, the South Carolina Department of Health and Environmental Control (SCDHEC) will be notified that the sampling grid needs to be extended in those directions where the plume is undefined. Any additional soil borings will be advanced using the same methods as the initial borings.

Once the extent of soil and groundwater contamination has been determined, a background soil boring will be made in nearby uncontaminated soil. One upgradient temporary monitoring well and the downgradient temporary monitoring well will be converted to permanent monitoring wells.

Detailed information including lithologic descriptions, split-spoon samples, groundwater elevations and other pertinent data for each monitoring well will be presented in the Assessment Report. Soil will be classified in accordance with the unified Soil Classification System.

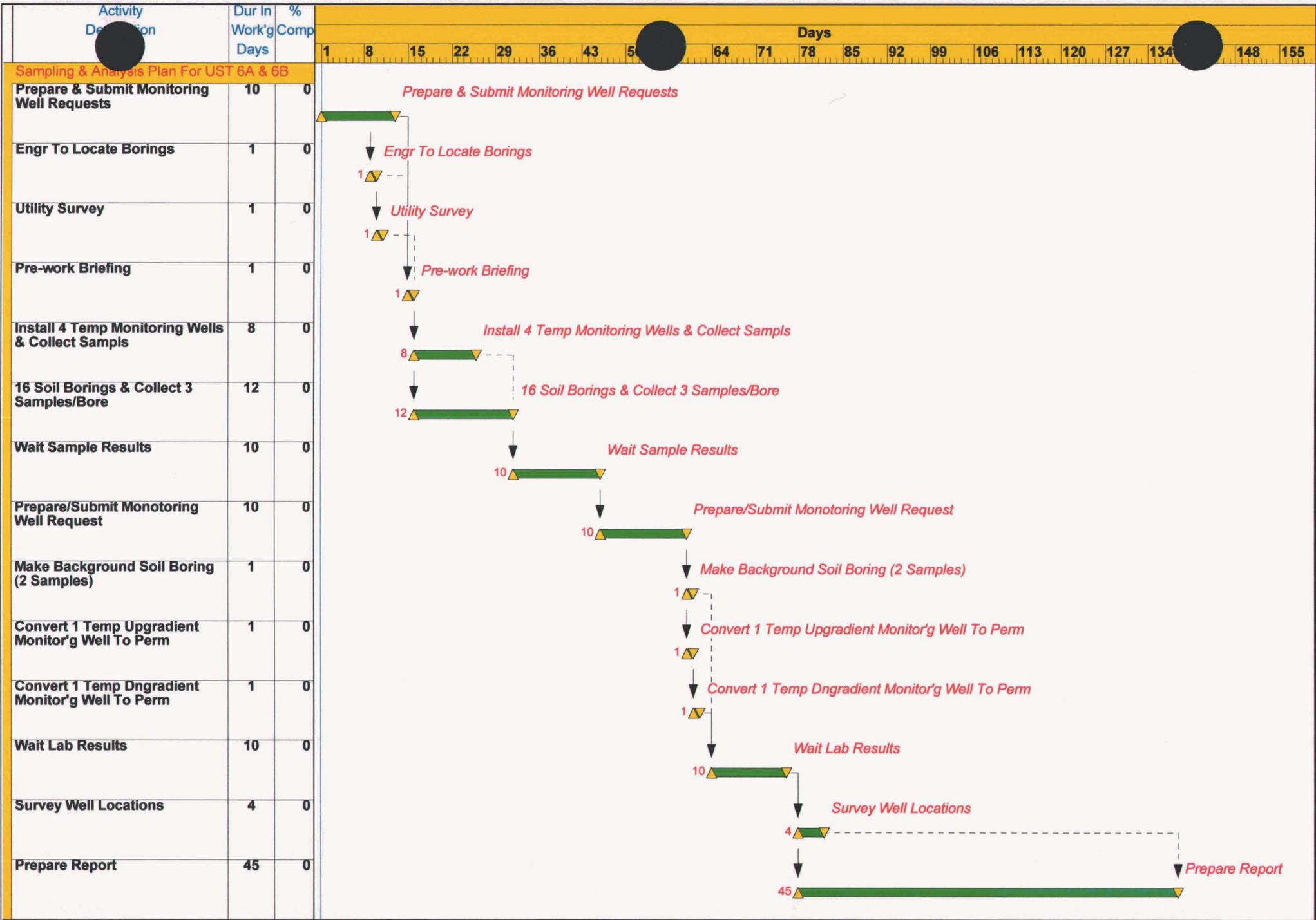
All wastes shall be disposed of in accordance with the Investigation Derived Waste (IDW) procedures included in Section 16 of the RFI CSAP.

4.2 PREPARATION OF REPORTS. After completion of the field investigation, an assessment report will be prepared and submitted to Southern Division Naval Facilities Engineering Command (SOUTHDIV) for review and approval. The report will discuss site background information, site conditions, findings and recommendations for the former UST site at Building 6. Recommendations will also be made as to the need for any follow-up investigations. Site location maps, locations of soil borings and soil contamination delineation maps will be included with the report.



5.0 SCHEDULE

A projected schedule to complete the SAP field investigation at the site for USTs 6A and 6B is approximately 12 weeks (see Figure 5-1). This includes mobilization, drilling, sampling, surveying and demobilization.. An Assessment Report for the site is scheduled for delivery within 45 days after completion of the field investigation.



| | | | |
|----------------|-----------|--|-------------------|
| Project Start | 01-APR-96 | | Early Bar |
| Project Finish | 23-AUG-96 | | Progress Bar |
| Data Date | 01-APR-96 | | Critical Activity |
| Plot Date | 30-JUN-97 | | |

(c) Primavera Systems, Inc.

Sample & Analysis Plan For UST 6A/6B
Figure 5-1 **Page 5-2**
Environmental Detachment Charleston



REFERENCES

Ensafe/Allen & Hoshall, Final Comprehensive Sampling and Analysis Plan (CSAP) RCRA Facility Investigation dated August 30, 1994

Ensafe/Allen & Hoshall, Draft Zone I RCRA Facility Investigation Report NAVBASE Charleston dated January 1996

Ensafe/Allen & Hoshall, Final RCRA Facility Investigation Report for Zone H Naval Base Charleston dated July 5, 1996

SCDHEC Underground Storage Tank Assessment Guidelines for Permanent Closure, Change-in Owner and Change-in-Service dated June 1995

SCDHEC Risk-Based Corrective Action for Petroleum Releases

South Carolina R. 61-71 South Carolina Well Regulations and Standards

SUPSHIP Portsmouth Va., Environmental Detachment Charleston, Base Realignment and Closure Tank Management Plan

United States Environmental Protection Agency (USEPA) Environmental Services Division *Standard Operating Procedures and Quality Assurance Manual (SOPQAM)*

SITE SPECIFIC HEALTH AND SAFETY PLAN

1.0 Purpose

This plan provides supplemental site specific information and is to be used with the Detachment Comprehensive Health and Safety Plan.

2.0 Work Location

Former petroleum oil underground storage tank locations.

3.0 Work Scope Brief (refer to the work document for full details)

The work scope is to perform a sampling program that will evaluate the horizontal and vertical extent of petroleum contamination in soil and determine the extent of ground water contamination.

4.0 Hazards

The primary health hazard is from petroleum oils which are a primary irritant. Dermatitis, a defatting of the skin, can result from continued skin contact. Some individuals develop hypersensitivity.

Safety hazards include the personal injury hazards of heavy equipment operation, and the dangers of underground and above ground utility installations.

5.0 Personal Protective Equipment

Gloves and coveralls (either tyvek or cloth). If oil soaked soil is encountered, shoe covers or boots should be worn. At the employee's option an organic vapor respirator may be worn, although it is not required.

6.0 Special Personnel Training Qualifications

Hazwoper training.

7.0 Occupational Safety and Health Precautions

Prior to the start of work the area must be checked for the presence of above or below ground utilities, and they must be marked and secured by lockout tagout if they will be endangered. Follow the detachment policy and procedures for location and evaluation of these utilities.

Wash hands before eating or smoking.

If work requires entry into a confined space, contact the project engineer for additional instructions, as a confined space entry permit and gas testing may be required.

Work that involves sewage exposure (e.g. standing sewage liquid or broken sewer pipes), will require the use of workers who are in the NavHospChas C5 medical surveillance program. These workers shall avoid skin exposure by using appropriate protective equipment such as aprons, tyvek suits, boots, and latex or plastic gloves worn under heavier protective gloves. If splashing is a hazard, wear face shields over goggles. Sewage wetted clothing should be removed promptly and the person should then wash with soap and water. Wet clothing should be bagged and then washed separately with hot soap and water and one cup of bleach per wash load. Sewage contaminated equipment should be washed with soap, water, and bleach. Wash hands and face after any contact or sewage work and prior to eating, smoking or going home.

Sewage work also has a risk of fire, explosion, and oxygen deficiency due to the possibility of gases. Cutting of sewer pipes, or the repair of accidentally damaged pipes, should be done only after an assessment of the work by the team leader or project engineer. Typically, gas testing and the use of a confined space entry permit will be required.

8.0 Material safety data sheets

A typical MSDS for fuel oil is included as part of the official folder.

9.0 Medical Surveillance

Hazardous waste worker, (B27,711). This code refers to a NAVHOSPCHASN Medical Surveillance Classification.